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(54) **PRE-COMPRESSION PUMP WITH REDUCED HEIGHT AND PREVENTING LIQUID SEEPAGE AND CONTAINER HAVING THE SAME**

(57) The present invention provides a pre-compression pump with reduced height and prevent liquid seepage and a container having the same. The pre-compression pump includes a main body, a first piston assembly movably mounted in the main body, a pressing head assembly provided on a top portion of the first piston assembly, a second piston movably mounted in the first piston assembly, and a second spring provided between the second piston and the first piston assembly. A water storage chamber is provided between the main body and the first piston assembly, and a water outlet channel is provided in the first piston assembly. The pressing head assembly includes a nozzle, and the water outlet channel is in communication with the water storage chamber and the nozzle. The second piston includes a pushing needle portion configured to close the water outlet channel.

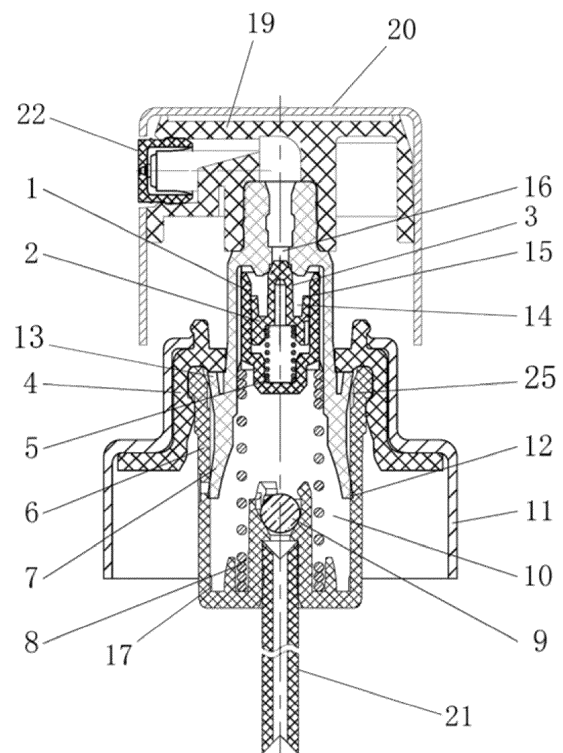


FIG. 1

Description

TECHNICAL FIELD

[0001] The present invention relates to the technical field of pre-compression pumps, in particular to a pre-compression pump with a reduced height and can prevent liquid seepage and a container having the same.

BACKGROUND

[0002] Pre-compression pumps are usually mounted on containers to spray various liquids stored in the container, such as perfume, pharmaceutical products, cosmetics, cleaning products, etc. Generally, the pre-compression pump is a device that sprays the liquid outward when the liquid is subjected to a specific pressure in a water storage tank, which ensures that the liquid can be sprayed better when the pressure is higher.

[0003] Various pre-compression pumps have appeared in the prior art, such as the pre-compression pump disclosed in patent application No. 202022571129.1, which has a water storage tank between a piston and a body. The piston will squeeze the water storage tank during the downward movement of a main column, and the pressure in the water storage tank will increase. When the pressure increases to exceed the force of a preset spring on the piston, the piston will be lifted upwards. At this time, a sealing portion is separated from an amplification cover, a channel is opened, and the liquid enters the channel and moves upward until it is sprayed out of a nozzle. Although this structure can reduce the leakage of liquid when the pressure does not meet the atomization conditions, but because an area of the pressure-bearing surface of the piston in contact with the liquid is relatively large, the displacement of the piston is relatively short after the force is applied, and the pressure of the liquid pumped out is weak. The sprayed liquid is usually linear or sprayed in the form of seepage, and the spraying effect is still insufficient.

[0004] Therefore, how to design a pre-compression pump and a container that can effectively improve the spraying effect is a technical problem to be solved urgently in the industry.

SUMMARY

[0005] In order to solve the above-mentioned defect in the prior art, a pre-compression pump with reduced height and prevent liquid seepage and a container having the same are provided. By adding components such as a second piston and a second spring in a first piston assembly, the spraying effect of the pre-compression pump is better and the overall height of the pre-compression pump is reduced.

[0006] The present invention provides a pre-compression pump with reduced height and prevent liquid seepage, which includes a main body, a first piston assembly

movably mounted in the main body, a pressing head assembly provided on a top portion of the first piston assembly, a second piston movably mounted in the first piston assembly, and a second spring provided between the second piston and the first piston assembly. A water storage chamber is provided between the main body and the first piston assembly, and a water outlet channel is provided in the first piston assembly. The pressing head assembly includes a nozzle, and the water outlet channel is in communication with the water storage chamber and the nozzle. The second piston includes a pushing needle portion configured to close the water outlet channel.

[0007] In one of the embodiments, the first piston assembly includes a first piston movably provided in the main body, a spring retainer mounted in the first piston, and a first spring provided between the main body and the spring retainer, the water storage chamber is formed between the first piston and the main body, the second piston is movably provided in the spring retainer, the second spring is provided between the spring retainer and the second piston, a variable pressure chamber is formed between a top portion of the second piston and the first piston, and the variable pressure chamber is in communication with the water storage chamber. When the first piston is displaced and the water storage chamber is under pressure, the second piston will have a larger displacement in a smaller-diameter variable pressure chamber, and the pre-compression pump will not generate seepage and directly sprays the liquid with better performance.

[0008] In one of the embodiments, a compression chamber is formed between a bottom portion of the second piston and the spring retainer, the second piston is provided with an inner elastic expanding portion expanding outward, and an outer edge of the inner elastic expanding portion is in contact with an inner wall of the spring retainer to seal the compression chamber.

[0009] In one of the embodiments, a side wall of the main body is provided with an exhaust hole, an outer edge of the bottom portion of the first piston expands outwards to form a lower elastic expanding portion configured to seal the water storage chamber, the main body is provided with an exhaust adjustment protruding strip located below the lower elastic expanding portion, and the lower elastic expanding portion deforms when moving downward to be in contact with the exhaust adjustment protruding strip, so as to allow air in the water storage chamber to leak out.

[0010] In one of the embodiments, a top portion of the main body is provided with an opening, a collar member is fixedly mounted at the opening and is provided with a central hole to receive the first piston, the first piston includes a tapered section with a gradually increased size from top to bottom, and an inner wall of the central hole is in contact with the tapered section to form a line seal, so as to ensure that the liquid in the container will not leak under vibration and certain negative pressure.

[0011] In one of the embodiments, an outer edge of

the top portion of the first piston extends outwards to form an upper elastic expanding portion, an outer edge of the upper elastic expanding portion is sealed to an inner wall of the main body, a top portion of the main body is provided with an air intake groove, and the upper elastic expanding portion is capable of moving downward along with the first piston to the air intake groove, so that the air in the external environment can pass through the gap between the collar member and the first piston, and flows between the upper elastic expanding portion and the lower elastic expanding portion through the air intake groove, and then enters the container through the exhaust hole of the main body, so as to maintain the pressure in the container consistent with the external environment, so as to ensure the continuous use of the pump body.

[0012] In one of the embodiments, the water outlet channel is provided in the first piston and is located above the second piston, the pushing needle portion is provided on a top portion of the second piston, an end of the water outlet channel adjacent to the second piston is provided with at least one step, a size of the pushing needle portion gradually increases from top to bottom, and an edge of each step is in contact with the pushing needle portion to form a line seal to prevent seepage when the pressure of the pump body is insufficient.

[0013] In one of the embodiments, the main body is provided with a water inlet channel in communication with the water storage chamber, the check valve ball is placed on the top portion of the water inlet channel, a suction pipe is connected to a bottom portion of the water inlet channel, an outer periphery of the check valve ball is surrounded by at least three limiting ribs spaced apart, and the check valve ball is capable of moving up and down within a space enclosed by the limiting ribs, the space between the limiting ribs allows the liquid in a container to enter the water storage chamber more smoothly.

[0014] The present invention further provides a container, which includes a bottle and the aforementioned pre-compression pump mounted on the bottle.

[0015] In one of the embodiments, the bottle is provided with a connecting opening, the main body is mounted in the connecting opening, the collar member is fixedly mounted on a top portion of the main body, and a fixing sleeve wraps an outer edge of the connecting opening and is configured to fix the collar member to the bottle.

[0016] Compared with the related art, according to the present invention, the second piston and the second spring are mounted in the first piston assembly, and the variable pressure chamber is provided between the first piston assembly and the second piston. When the pressure of the water storage chamber does not reach a specific value, the pushing needle portion of the second piston closes the water outlet channel. When the pressure on the second piston can overcome the pre-pressure of the second spring, the second piston moves downward to open the water outlet channel with a relatively large displacement, and the pressure of the liquid pumped out is large, which effectively optimizes the spraying effect.

Further, since the variable pressure chamber is provided in the first piston, the height of the pre-compression pump can be greatly reduced.

5 BRIEF DESCRIPTION OF THE DRAWINGS

[0017]

FIG. 1 is a longitudinal cross-sectional view of a pre-compression pump according to an embodiment of the present invention.

FIG. 2 is an exploded view of the pre-compression pump according to an embodiment of the present invention.

FIG. 3 is a cross-sectional view of a container according to an embodiment of the present invention.

FIG. 4 is a longitudinal cross-sectional view of the pre-compression pump of the present invention when air is exhausted.

FIG. 5 is a longitudinal cross-sectional view of the pre-compression pump of the present invention when the pre-compression pump sucks liquid.

FIG. 6 is a longitudinal cross-sectional view of the pre-compression pump of the present invention in use for spraying.

[0018] Description of reference numerals: 1, spring retainer; 2, second piston; 3, pushing needle portion; 4, collar member; 5, second spring; 6, main body; 7, first piston; 8, first spring; 9, check valve ball; 10, water storage chamber; 11, fixing sleeve; 12, lower elastic expanding portion; 13, upper elastic expanding portion; 14, variable pressure chamber; 15, inner elastic expanding portion; 16, water outlet channel; 17, exhaust adjustment protruding strip; 18, exhaust hole; 19, pressing head; 20, covering member; 21, suction pipe; 22, nozzle; 23, gap; 24, bottle; 25, air intake groove; 100, container.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0019] The technical solution in the embodiment of the present application will be clearly and completely described below in conjunction with the drawings in the embodiment of the application. Apparently, the described embodiments are only some of the embodiments of the application, not all of them. Based on the embodiments in the present application, all other embodiments obtained by a person skilled in the art without making creative efforts shall all fall within the protection scope of the present application.

[0020] A pre-compression pump provided by the present invention is configured to be mounted on a container for storing liquid, and the liquid in the container can be sucked up and sprayed out by pressing the pre-compression pump. Specifically, as shown in FIG. 1, the pre-compression pump includes a main body 6, a first piston assembly, a pressing head assembly, a second piston 2, and a second spring 5. The first piston assembly is

mounted in the main body 6, and the pressing head assembly is mounted on a top portion of the first piston assembly. A water storage chamber 10 is provided between the main body 6 and the first piston assembly. A water outlet channel 16 is provided in the first piston assembly, and the water outlet channel 16 is in communication with the water storage chamber 10 and a nozzle 22 of the pressing head assembly. The liquid in the water storage chamber 10 can be sprayed out of the nozzle 22 through the water outlet channel 16. The second piston 2 is mounted in the first piston assembly, the second spring 5 is provided between the second piston 2 and the first piston assembly, and a top portion of the second piston 2 is provided with a pushing needle portion 3. The second piston 2 can be supported by the elastic force of the second spring 5, the pushing needle portion 3 is pressed against a bottom portion of the water outlet channel 16 to close the water outlet channel 16. When the second piston 2 is subjected to a pressure that can overcome the pre-pressure of the second spring 5, the second piston 2 moves downward, and the pushing needle portion 3 is separated from the water outlet channel 16, so that the water outlet channel 16 is opened. The first piston assembly, the second piston 2, and the second spring 5 of the present invention cooperatively form a pre-compression piston assembly with a shorter overall height and a better spraying effect.

[0021] In order to better understand the pre-compression pump of the present invention, the structure of each portion of the pre-compression pump will be described in detail below in conjunction with embodiments.

[0022] As shown in FIG. 1, the first piston assembly includes a first piston 7, a first spring 8, and a spring retainer 1. An interior of the first piston 7 is hollow and mounted in the main body 6. The water storage chamber 10 is formed between an inner wall of the first piston 7 and the main body 6. A volume of the water storage chamber 10 changes as the first piston 7 moves up and down. The spring holder 1 is fixedly mounted in the first piston 7, and is located below the water outlet channel 16. The first spring 8 is provided between the main body 6 and the spring retainer 1, and the first spring 8 provides an upward supporting force to the spring retainer 1, which means that both the spring retainer 1 and the first spring 8 are in the water storage chamber 10. A gap is provided between the spring retainer 1 and the inner wall of the first piston 7 to allow the liquid to pass through.

[0023] The spring retainer 1 is provided with an accommodating cavity with an opening facing the water outlet channel 16, and the second piston 2 is movably provided in the accommodating cavity of the spring retainer 1. A variable pressure chamber 14 is formed between the top portion of the second piston 2 and the first piston 7. A volume of the variable pressure chamber 14 changes as the second piston 2 moves up and down. The variable pressure chamber 14 is in communication with the water storage chamber 10, that is, the liquid in the water storage chamber 10 can enter the variable pressure chamber 14

above the second piston 2 through a gap between the spring retainer 1 and the first piston 7.

[0024] An outer edge of the top portion of the second piston 2 slightly expands outwards to form an inner elastic expanding portion 15, which is in contact with an inner wall of the spring retainer 1. A compression chamber is formed between a bottom portion of the second piston 2 and the spring retainer 1. The inner elastic expanding portion 15 isolates the compression chamber and the variable pressure chamber 14. The second spring 5 is located in the compression chamber and is provided between the second piston 2 and the spring retainer 1. When the pressure of the variable pressure chamber 14 increases, the second piston 2 overcomes the pre-pressure of the second spring 5 and moves downward, the air in the compression chamber and the second spring 5 are both compressed, the water outlet channel 16 is opened. When the pressure of the variable pressure chamber 14 decreases, the second piston 2 is jointly pushed upward by the compressed air and the second spring 5, and the water outlet channel 16 is closed. The variable pressure chamber 14, the second piston 2 and the second spring 5 are provided in the first piston assembly to form the pre-compression piston assembly. Compared with the conventional pre-compression pump, a space occupied by the pre-compression piston assembly is reduced, so as to minimize an overall height of the pre-compression pump, so that the structure of the pre-compression pump is more compact.

[0025] According to the conventional pre-compression pump, in order to achieve the spraying effect, the liquid in the water storage chamber must reach a specific minimum pressure before the liquid starts to spray out. However, due to the low pressure at this time, the sprayed liquid is linear or sprayed in the form of seepage. Only when a greater pressing force is provided, the liquid can be sprayed well, and the spraying effect is greatly dependent on the pressing force of the user, and the use experience is poor.

[0026] The pre-compression pump provided by the present invention can also address the problem of liquid seepage effectively, and the working principle of the pre-compression pump is as follows. In order to enable a pressure on the second piston 2 in the variable pressure chamber 14 to reach a specific minimum pressure, i.e., the pre-pressure of the second spring 5, the pressing head assembly needs to provide a greater pressure, and the second piston 2 generates a greater moving distance. A lateral area of the first piston 7 in contact with the liquid is S_1 , a lateral area of the second piston 2 in contact with the liquid is S_2 , a moving distance of the first piston 7 is H_1 , a moving distance of the second piston 2 is H_2 , and the specific minimum pressure is F_{pre} , then the pressure $F_{pressure}$ to be provided by the pressing head assembly is calculated by the following formula

$F_{\text{pressure}} = \frac{S_1}{S_2} \times F_{\text{pre}}$, and the moving distance H_2 of the second piston is by the following formula

$H_2 = \frac{S_1}{S_2} \times H_1$, so that the liquid will not spray when the pressure is small. When the pressing force becomes greater, the second piston 2 quickly opens a larger channel, such that the pre-compression pump can avoid liquid seepage, and directly spray liquid with better performance, which greatly optimizes the use experience of the pre-compression pump.

[0027] As shown in FIGS. 1 and 2, the pressing head assembly includes a nozzle 22, a pressing head 19, and a covering member 20. The pressing head 19 is mounted on the top portion of the first piston 7. The covering member 20 covers the pressing head 19. A side portion of the covering member 20 is provided with a side hole, and the nozzle 22 is inserted into the pressing head 19 through the side hole of the covering member 20. An inner end of the nozzle 22 is in communication with the water outlet channel 16 through the pressing head 19. An outer end of the nozzle 22 is coplanar with an outer surface of the side wall of the covering member 20, so as to maintain the aesthetic appearance of the pressing head assembly. The water outlet channel 16 is provided on the top portion of the first piston 7, and is located above the second piston 2. The pushing needle portion 3 is provided on the top portion of the second piston 2. The pushing needle portion 3 can move upward along with the second piston 2 to close the water outlet channel 16, or the pushing needle portion 3 can move downward to open the water outlet channel 16. The water outlet channel 16 is provided with at least one step adjacent to the bottom portion of the second piston 2. A size of the pushing needle portion 3 gradually increases from top to bottom. An edge of each step is in contact with the pushing needle portion 3 to form a line seal, where the edge of the step refers to a corner position of the step protruding toward the water outlet channel 16.

[0028] In some embodiments, two steps are provided at the bottom portion of the water outlet channel 16. An edge of the water outlet channel 16 is provided with a chamfer to form a first step. An edge of the first step is provided with a circle of upwardly recessed groove to form a second step. Both the edges of the first step and the second step are in contact with the pushing needle portion 3 to form line seals. The double line seal can effectively prevent the liquid in the water storage chamber 10 from seeping out, and effectively solve the phenomenon of seepage when the pump body is under low pressure.

[0029] A bottom portion of the main body 6 is provided with a water inlet channel, a top portion of the water inlet channel is located in the water storage chamber 10 and is in communication with the water storage chamber 10. The pre-compression pump further includes a check

valve ball 9 provided on a top portion of the water inlet channel and a suction pipe 21 connected to a bottom portion of the water inlet channel. An outer periphery of the check valve ball 9 is surrounded by at least three limiting ribs spaced apart. The check valve ball 9 is capable of moving up and down within a space enclosed by the limiting ribs. The space between the limiting ribs allows the liquid in a container 100 to enter the water storage chamber 10 more smoothly.

[0030] As shown in FIGS. 3 and 4, a side wall of the main body 6 is provided with an exhaust hole 18, and an outer edge of a bottom portion of the first piston 7 expands outwards to form a lower elastic expanding portion 12. The lower elastic expanding portion 12 is in contact with an inner wall of the main body 6, so as to seal the water storage chamber 10 between the first piston 7 and the main body 6. An interior of the main body 6 is provided with an exhaust adjustment protruding strip 17 located below the lower elastic expanding portion 12. When the first piston 7 moves downward until the lower elastic expansion portion 12 is in contact with the exhaust adjustment protruding strip 17, the lower elastic expansion portion 12 will be deformed. The air in the water storage chamber 10 overflows outwards through a gap between the lower elastic expanding portion 12 and the exhaust adjustment protruding strip 17, and enters the container 100 through the exhaust hole 18. The pre-compression pump can obtain different ejection volumes by adjusting a length of the exhaust adjustment protruding strip 17 of the main body 6. When the length of the exhaust adjustment protruding strip 17 increases, a contact position between the first piston 7 and the exhaust adjustment protruding strip 17 will become higher, a length of the water storage chamber 10 which is kept sealed will decrease, and the amount of liquid pumped will also decrease accordingly.

[0031] A top portion of the main body 6 is provided with an opening. The pre-compression pump further includes a collar member 4 fixedly mounted at the opening. The collar member 4 is provided with a central hole to receive the first piston 7. The first piston 7 includes a tapered section with a gradually increased size from top to bottom. When the first piston 7 is not pressed downward by an external force, the first piston 7 is in an upper limit position under the supporting force of the first spring 8, and the tapered section is in contact with an inner wall of the central hole to form a line seal, so as to isolate the interior of the main body 6 from the external environment.

[0032] An outer edge of the top portion of the first piston 7 expands outwards to form an upper elastic expanding portion 13. An outer edge of the upper elastic expanding portion 13 is sealed to an inner wall of the main body 6 to prevent the liquid in the water storage chamber 10 from leaking outwards. The top portion of the main body 6 is provided with an air intake groove 25, and the upper elastic expanding portion 13 can move downward along with the first piston 7 to the air intake groove 25. At this time, the tapered section of the first piston 7 moves down-

ward to form a gap 23 between the collar member 4 and the first piston 7, and the exhaust hole 18 is located between the upper elastic expanding portion 13 and the lower elastic expanding portion 12, so that the air from the external environment can enter the main body 6 through the gap 23 between the collar member 4 and the first piston 7 and the air intake groove 25, and then enter the container 100 through the exhaust hole 18 of the main body 6. That is, when the pre-compression pump is pressed to spray liquid outward, the reduced liquid in the container 100 can be replenished into the container 100 by external air through the exhaust hole 18, so as to prevent the container 100 from being deformed or the failure of the pump body due to the vacuum generated in the container 100.

[0033] It should be noted that the supplementary air from the external environment to the container 100 occurs during the pressing start process, and the upper elastic expanding portion 13 of the first piston 7 passes through the air intake groove 25 downward or upward to supplement the gas. The outer edge of the upper elastic expanding portion 13 is in contact with the inner wall of the main body 6 again to ensure that the liquid in the water storage chamber 10 will not leak outward.

[0034] Since the top portion of the main body 6 is provided with the opening, various components such as the first spring 8, the check valve ball 9, the first piston 2, the spring retainer 1, the second piston 2, and the second spring 5 can be mounted through the opening, then the collar member 4 is mounted to be buckled and fixed to the main body 6, which not only facilitates the assembly of the pre-compression pump, but also prevents the components from being scattered and improves the structural stability.

[0035] The use of the pre-compression pump will be described in greater detail below.

[0036] As shown in FIGS. 1 to 3, when the pressing head assembly is pressed for the first time, the pressing head assembly drives the pre-compression piston assembly to overcome the pre-pressure of the first spring 8 and move downward. At this time, the second piston 2 is sealed with the first piston 7 under the pre-pressure of the second spring 5, the check valve ball 9 is sealed with the main body 6, and the first piston 7 is sealed with the main body 6 under the action of the lower elastic expanding portion 12. The pre-compression piston assembly slide downward along the main body 6, and the air in the water storage chamber 10 and the variable pressure chamber 14 that are in communication with each other is compressed as a sealing space becomes smaller. As shown in FIG. 4, when the pre-compression piston assembly moves downward until the lower elastic expanding portion 12 of the first piston 7 is into contact with the exhaust adjustment protruding strip 17 in the main body 6, the lower elastic expanding portion 12 is elastically deformed, and the compressed air in the water storage chamber 10 is released from the exhaust adjustment protruding strip 17, and then is discharged through the ex-

haust hole 18 on the side wall of the main body 6.

[0037] Then the pressing head assembly is released, the pressing head assembly and the pre-compression piston assembly begin to move upward under the resilience of the first spring 8. At this time, the first piston 7 is separated from the exhaust adjustment protruding strip 17 provided in the main body 6, the lower elastic expanding portion 12 is in contact with the inner wall of the main body 6 again, and a communication space between the water storage chamber 10 and the variable pressure chamber 14 is restored to be sealed. As shown in FIG. 5, as the pre-compression piston assembly moves upward, the sealed space becomes larger to form a vacuum. At this time, the liquid in the container enters the water storage chamber 10 from the suction pipe 21 through the check valve ball 9 under the force of the vacuum. After repeating the above pressing process several times, all the air in the sealed space is replaced by liquid.

[0038] After the sealed space is filled with liquid, the pressing head assembly is pressed. As the pre-compression piston assembly moves downward, the sealed space gradually becomes smaller. At this time, a pressure is generated in the liquid, and all portions in contact with the liquid are subject to the pressure. When the pressure on the second piston 2 exceeds the pre-pressure of the second spring 5, the second piston 2 moves away from the water outlet channel 16 of the first piston 7, and the water outlet channel 16 is opened. At this time, the liquid enters the pressing head assembly through the water outlet channel 16, and is sprayed outward by the nozzle 22. As shown in FIGS. 3 and 6, since the liquid in the container 100 is reduced to form a vacuum, during the downward movement of the pre-compression piston assembly, the external air passes through the gap 23 between the collar member 4 and the first piston 7 and the air intake groove 25, and enters the container 100 through the exhaust hole 18 of the main body 6, so as to ensure that the pressure in the container 100 is consistent with the external environment, and realize the function of the pump body for continuous use.

[0039] As shown in FIG. 3, the present invention further provides a container 100, which includes a bottle 24 and the above-mentioned pre-compression pump mounted on the bottle 24. The suction pipe 21 of the pre-compression pump is placed in the bottle 24, and the exhaust hole 18 on the main body 6 is in communication with an inner cavity of the bottle 24, so that when the liquid in the bottle 24 decreases, the air from the external environment is replenished into the bottle 24 to maintain the function of the pre-compression pump. A top portion of the bottle 24 is provided with a connecting opening with tightened size. The main body 6 is inserted into the connecting opening, and the collar member 4 is located outside the connecting opening. A fixing sleeve 11 wraps an outer edge of the connecting opening and is configured to fix the collar member 4 to the bottle 24, so as to prevent the pre-compression pump from falling off and loosening from the bottle 24.

Claims

1. A pre-compression pump, comprising:

a main body (6);
 a first piston assembly movably mounted in the main body (6), a water storage chamber (10) being provided between the main body (6) and the first piston assembly, and a water outlet channel (16) being provided in the first piston assembly;
 a pressing head assembly provided on a top portion of the first piston assembly, the pressing head assembly comprising a nozzle (22), and the water outlet channel (16) being in communication with the water storage chamber (10) and the nozzle (22);
 a second piston (2) movably mounted in the first piston assembly, the second piston (2) comprising a pushing needle portion (3) configured to close the water outlet channel (16); and
 a second spring (5) provided between the second piston (2) and the first piston assembly.

2. The pre-compression pump according to claim 1, wherein the first piston assembly comprises a first piston (7) movably provided in the main body (6), a spring retainer (1) mounted in the first piston (7), and a first spring (8) provided between the main body (6) and the spring retainer (1), the water storage chamber (10) is formed between the first piston (7) and the main body (6), the second piston (2) is movably provided in the spring retainer (1), the second spring (5) is provided between the spring retainer (1) and the second piston (2), a variable pressure chamber (14) is formed between a top portion of the second piston (2) and the first piston (7), and the variable pressure chamber (14) is in communication with the water storage chamber (10).

3. The pre-compression pump according to claim 2, wherein a compression chamber is formed between a bottom portion of the second piston (2) and the spring retainer (1), the second piston (2) is provided with an inner elastic expanding portion (15) expanding outward, and an outer edge of the inner elastic expanding portion (15) is in contact with an inner wall of the spring retainer (1) to seal the compression chamber.

4. The pre-compression pump according to claim 2, wherein a side wall of the main body (6) is provided with an exhaust hole (18), an outer edge of the bottom portion of the first piston (7) expands outwards to form a lower elastic expanding portion (12) configured to seal the water storage chamber (10), the main body (6) is provided with an exhaust adjustment protruding strip (17) located below the lower elastic

expanding portion (12), and the lower elastic expanding portion (12) deforms when moving downward to be in contact with the exhaust adjustment protruding strip (17), so as to allow air in the water storage chamber (10) to leak out.

5. The pre-compression pump according to claim 4, wherein a top portion of the main body (6) is provided with an opening, a collar member (4) is fixedly mounted at the opening and is provided with a central hole to receive the first piston (7), the first piston (7) comprises a tapered section with a gradually increased size from top to bottom, and an inner wall of the central hole is in contact with the tapered section to form a line seal.

6. The pre-compression pump according to claim 5, wherein an outer edge of the top portion of the first piston (7) expands outwards to form an upper elastic expanding portion (13), an outer edge of the upper elastic expanding portion (13) is sealed to an inner wall of the main body (6), a top portion of the main body (6) is provided with an air intake groove (25), and the upper elastic expanding portion (13) is capable of moving downward along with the first piston (7) to the air intake groove (25), so as to allow external air to enter the exhaust hole (18).

7. The pre-compression pump according to claim 2, wherein the water outlet channel (16) is provided in the first piston (7) and is located above the second piston (2), the pushing needle portion (3) is provided on a top portion of the second piston (2), an end of the water outlet channel (16) adjacent to the second piston (2) is provided with at least one step, a size of the pushing needle portion (3) gradually increases from top to bottom, and an edge of each step is in contact with the pushing needle portion (3) to form a line seal.

8. The pre-compression pump according to claim 1, wherein the main body (6) is provided with a water inlet channel in communication with the water storage chamber (10), a check valve ball (9) is placed on a top portion of the water inlet channel, a suction pipe (21) is connected to a bottom portion of the water inlet channel, an outer periphery of the check valve ball (9) is surrounded by at least three limiting ribs spaced apart, and the check valve ball (9) is capable of moving up and down within a space enclosed by the limiting ribs.

9. A container (100), comprising:

a bottle (24); and
 the pre-compression pump according to any one of claims 1 to 8 mounted on the bottle (24).

10. The container (100) according to claim 9, wherein the bottle (24) is provided with a connecting opening, the main body (6) is mounted in the connecting opening, the collar member (4) is fixedly mounted on a top portion of the main body (6), and a fixing sleeve (11) wraps an outer edge of the connecting opening and is configured to fix the collar member (4) to the bottle (24).

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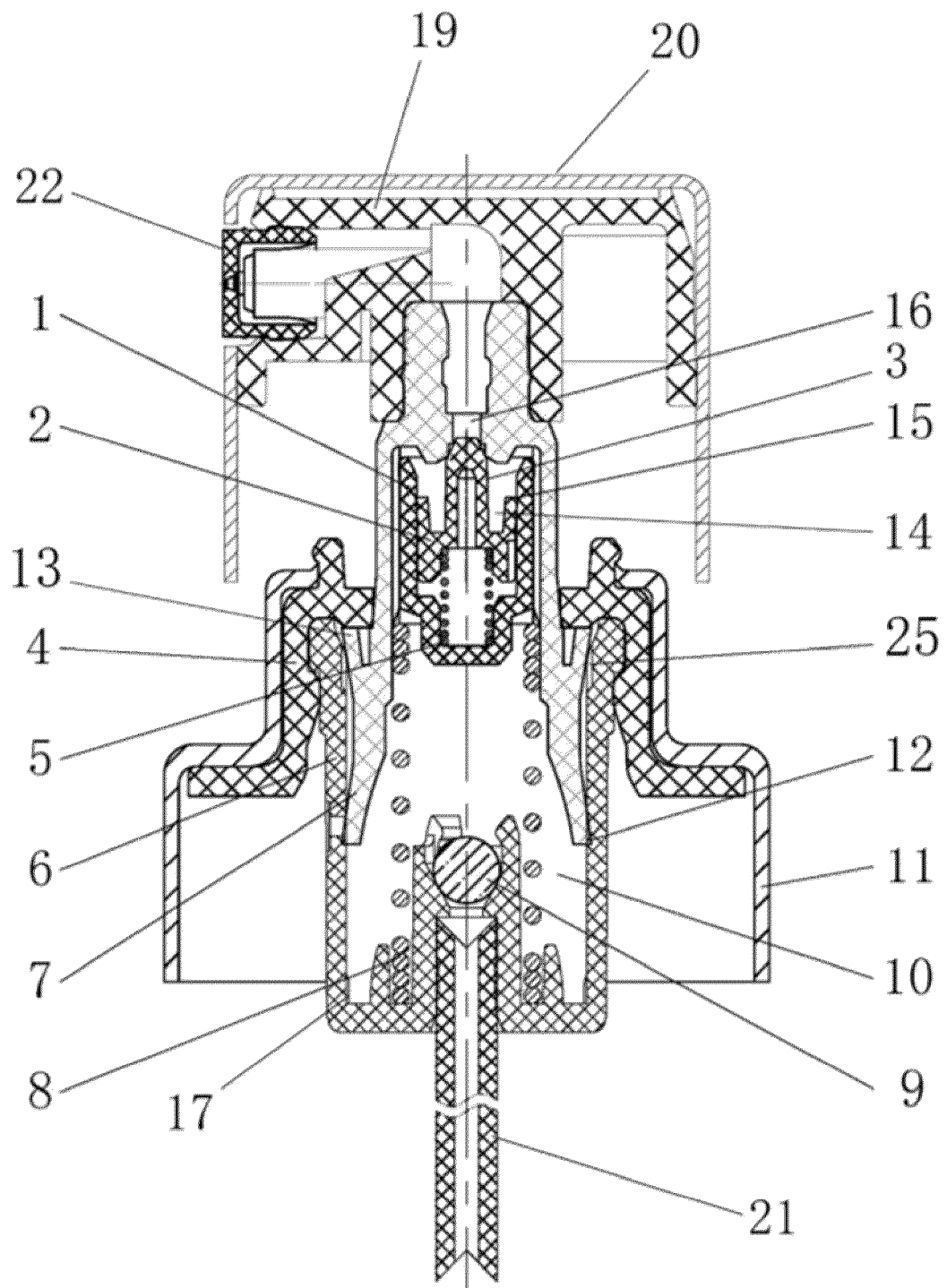


FIG. 1

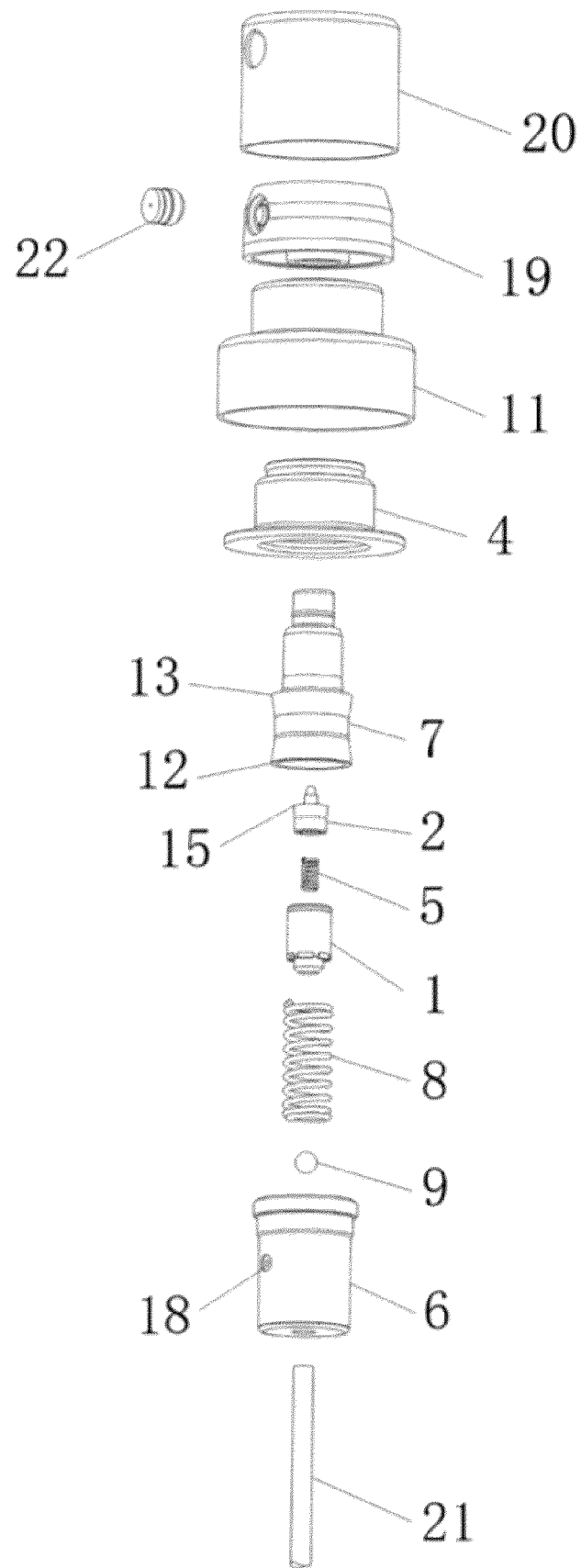


FIG. 2

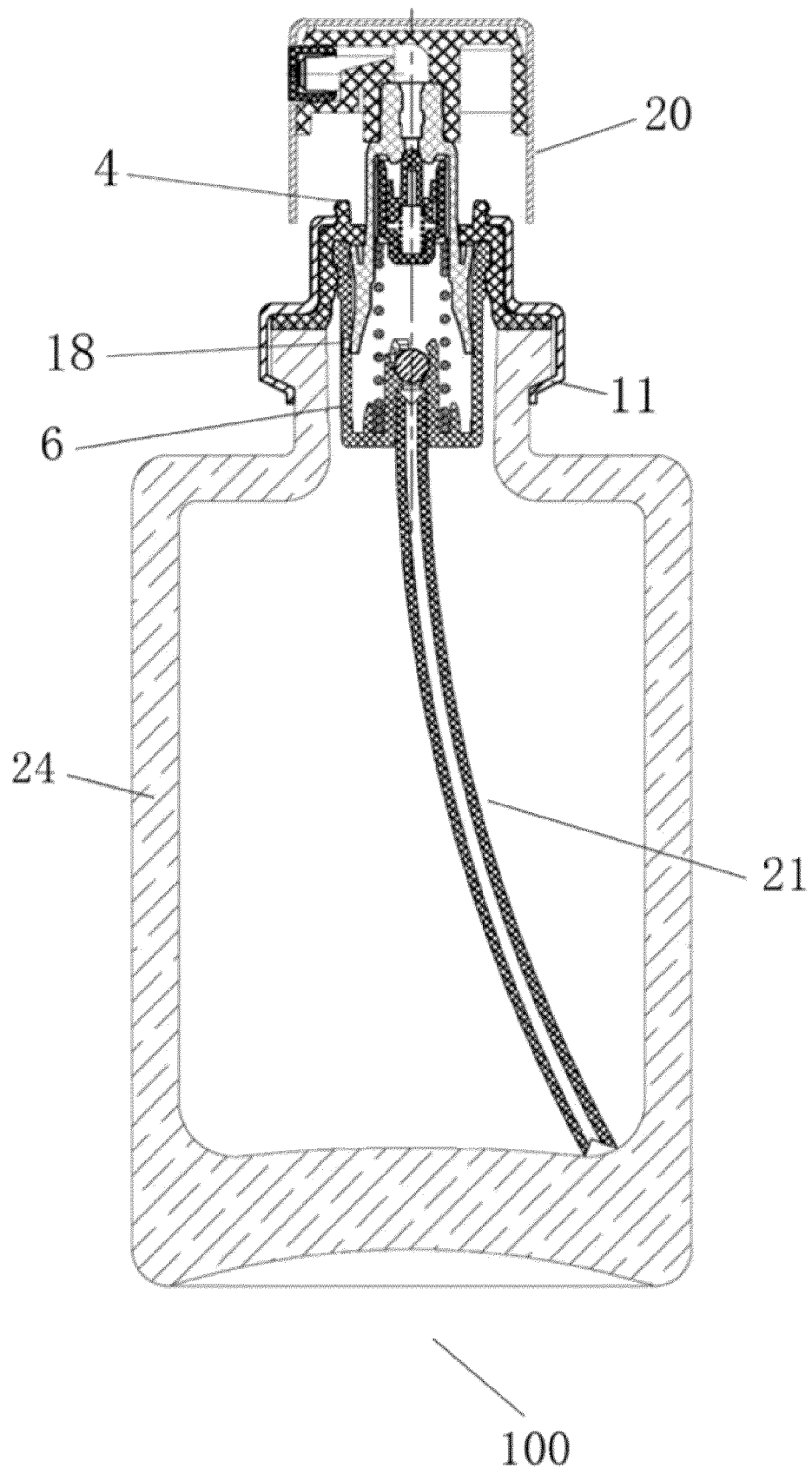


FIG. 3

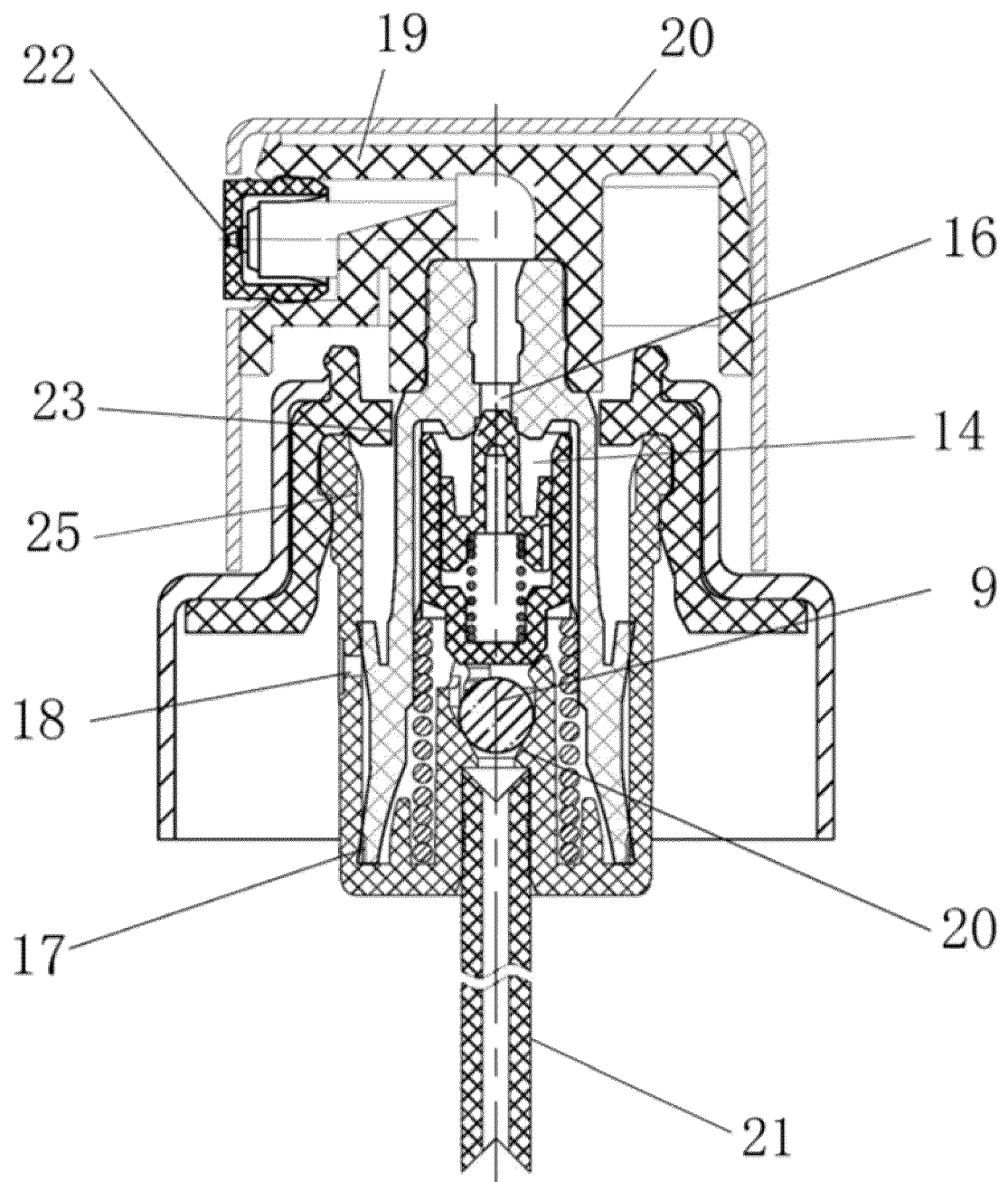


FIG. 4

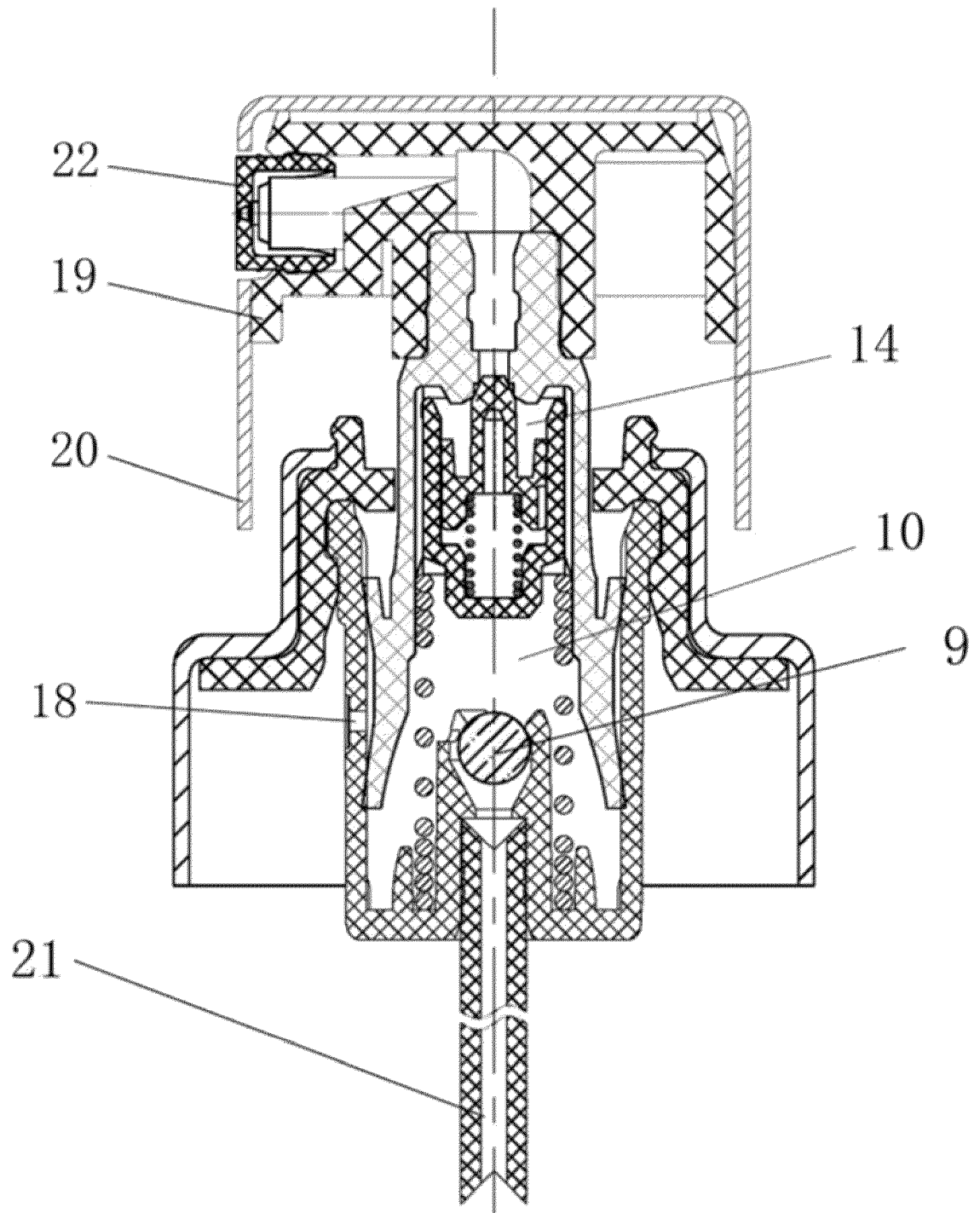


FIG. 5

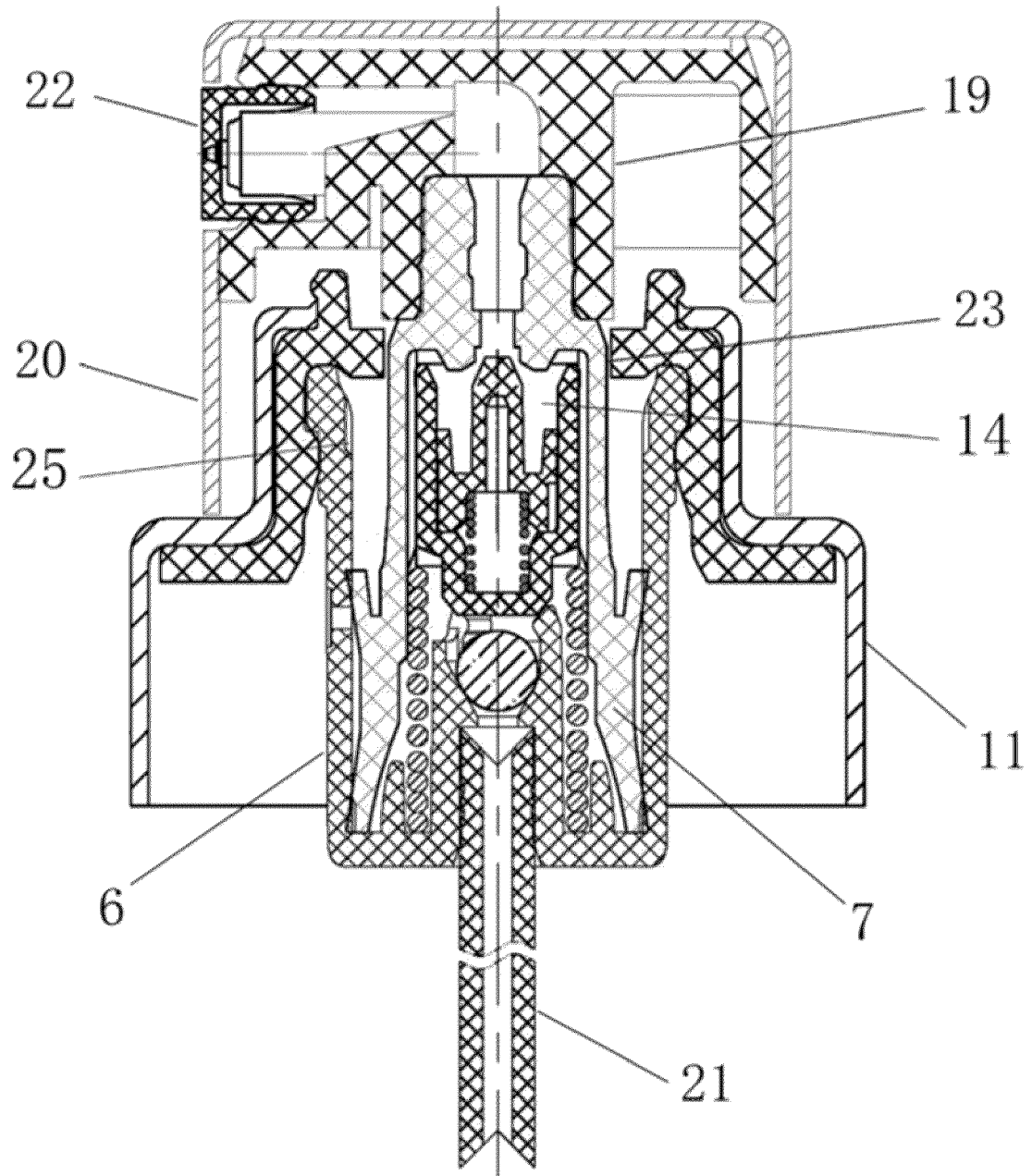


FIG. 6



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